U.S. Department of Transportation
National Highway Traffic Safety Administration

Memorandum

80-09-N11-001
NHTSA-96-1752-002

Subject: ACTION: PRE, Retroreflective Conspicuity Material On the Rears of Truck Tractors, FMVSS No. 108

Date: JUN 7 1995

From: Donald C. Bischoff
Associate Administrator
for Plans and Policy

Reply to Attn. of:

ORIGINAL

To: DOCKET

THRU: John Womack
Acting Chief Counsel

28 pgs

OK
32

Please submit the attached 10 copies of the "Preliminary Regulatory Evaluation, Retroreflective Conspicuity Material on the Rears of Truck Tractors, FMVSS No. 108", May 1995, to the appropriate docket.

Attachments

cc:
Associate Administrator for Safety Assurance
Associate Administrator for Research and Development
Acting Chief Counsel
Associate Administrator for Safety Performance Standards

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PRELIMINARY REGULATORY EVALUATION

National Highway Traffic Safety Administration

NOTICE OF PROPOSED RULEMAKING

Retroreflective Conspicuity Material on the Rears of Truck Tractors

FMVSS No. 108

Office of Regulatory Analysis

Plans and Policy

May 1995

002

SUMMARY
NOTICE OF PROPOSED RULEMAKING
Retroreflective Conspicuity Material on the Rears of Truck Tractors -- FMVSS No. 108

A. Notice of Proposed Rulemaking -- The agency is issuing an NPRM proposing to require the installation of strips of retroreflective material on the rears of truck tractors to make them more visible at night when they are operating without trailers.

B. Benefits

(1) Fatalities prevented: 4 - 7 annually

(2) Injuries prevented: 102 - 171 annually

(3) Crashes prevented: 264 annually

(4) Property damage savings:

		Per Vehicle
$4.8 mil.	lifetime (undiscounted)	$32
$4.3 "	" (2% disc. rate)	$29
$3.9 "	" (4% disc. rate)	$26
$3.5 "	" (7% disc. rate)	$23
$3.1 "	" (10% disc. rate)	$21

C. Costs

(1) Cost per vehicle -- $13.82 or $17.17, depending on location of bottom strips

(2) Total cost -- $2,073,000 to $2,575,000 annually

D. Leadtime -- 120 days

TABLE OF CONTENTS

I. INTRODUCTION

This Preliminary Regulatory Evaluation accompanies a Notice of Proposed Rulemaking (NPRM) to amend Federal Motor Vehicle Safety Standard No. 108, Lamps, Reflective Devices, and Associated Equipment, to require the installation of retroreflective material on the rears of truck tractors to make them more visible at night when they are operating without trailers. This analysis provides background information on the events leading up to this proposal, describes the proposed conspicuity treatment as specified in the NPRM, and assesses the benefits, costs, and other impacts of the proposed requirement.

II. BACKGROUND

On December 10, 1992, NHTSA issued a Final Rule requiring new large trailers (trailers which have an overall width of 80 inches or more and a GVWR of more than 10,000 pounds) to be equipped on the sides and rear with specified retroreflective conspicuity material (57 FR 58406). The requirement went into effect on December 1, 1993. This culminated over a decade of extensive agency research and analysis of conspicuity treatment for large vehicles. Since the regulation was enacted, the agency has issued technical amendments that clarify and extend the flexibility of where the conspicuity material may be placed on the sides and rears of trailers so that it can be readily applied to the wide variety of trailer designs in operation.

The comments to the NPRM on trailer conspicuity included recommendations that trucks and truck tractors be required to have conspicuity treatments. The agency restricted the NPRM proposal and the final rule requirement to large trailers because it appeared that the vast majority of fatal accidents in which trucks are struck at night involve tractor trailer combinations. However, the final rule notice noted that the rear lighting requirements for truck tractors are fewer than for other trucks and that there is a far higher accident involvement rate at night for tractors than for trucks. In the notice, the agency expressed its intention to consider the safety need for a rear conspicuity need for truck tractors.

III. THE NPRM

This NPRM proposes to require a practical conspicuity treatment for the rears of truck tractors. Far fewer crashes occur into the rears of tractors than into the rears of trailers because of a much lower exposure of tractors operating without trailers. Therefore, the magnitude of potential fatality and injury prevention and property damage savings from preventing crashes is much less for tractor conspicuity than for the previous regulation of trailer conspicuity. However, the proportions of fatalities, injuries, and crashes occurring at night are higher for tractors running bobtail (i.e., not pulling trailers) than for combinations. This is clearly shown in Table III-1, which presents the average number of fatalities, injuries (actually, injured occupants), and crashes into the rears of combinations, bobtails, and large single unit trucks that occurred annually over the 1990-1993 period and the proportion of these that occurred at night. As indicated, the proportion of crashes into the rears of truck tractors that occur at night is higher than that for combinations; the tractors' proportion is higher still relative to the proportion for single unit trucks -- tractors' nighttime proportion of fatalities being about one-and-a-half that for single unit trucks (59% vs. 40%) and tractors' nighttime proportion of injuries (46% vs, 21%) and crashes (33% vs. 16%) being over twice that of single unit trucks. Given the relative prominence of the problem of nighttime crashes into the rears of tractors, the anticipated crash-prevention effectiveness of conspicuity material, and the comparatively low cost of the small amount of reflective material necessary for effective conspicuity enhancement, the agency decided to propose enhancing the

TABLE III-1
CRASHES INTO REARS OF LARGE VEHICLES
AVERAGE ANNUAL NUMBER OF FATALITIES, INJURIES, AND CRASHES AND PROPORTION OCCURRING AT NIGHT*
1990-1993

A. Fatalities

	Average 1990-1993	Number at Night*	Proportion at Night*
Combinations	545	302	55%
Truck Tractors	51	30	59%
Large Single Unit Trucks	169	67	40%

B. Injuries

	Average 1990-1993	Number at Night*	Proportion at Night*
Combinations	10,273	3,572	35%
Truck Tractors	1,556	713**	46%
Large Single Unit Trucks	13,124	2,705	21%

C. Crashes

	Average 1990-1993	Number at Night*	Proportion at Night*
Combinations	20,754	5,089	25%
Truck Tractors	3,333	1,105	33%
Large Single Unit Trucks	26,641	4,237	16%

* Night includes the following light conditions: dark, dark but lighted, dawn, and dusk.

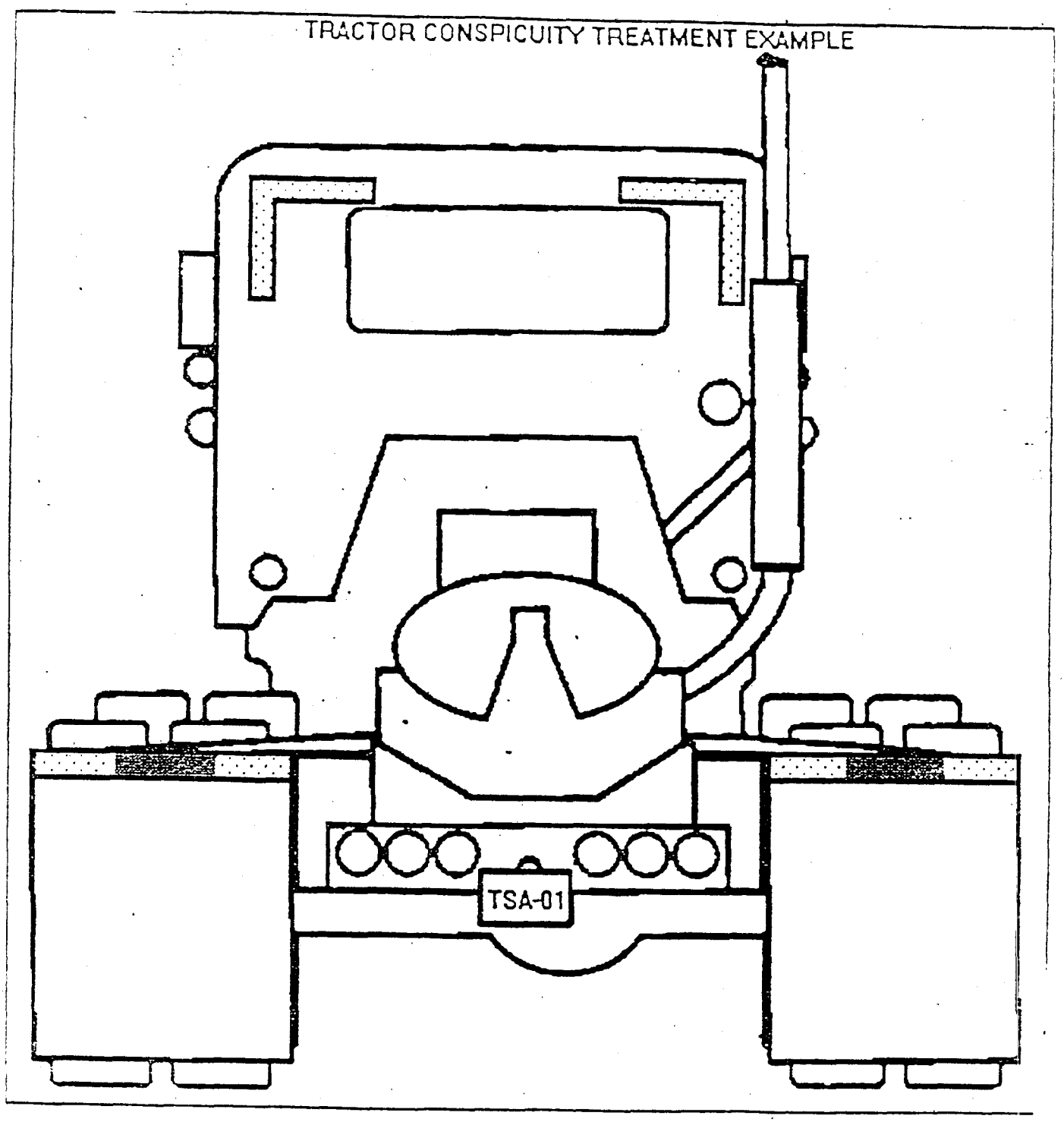
** AIS 1-2 injuries = 668
AIS 3+ injuries = 45
713 total persons injured

conspicuity of the backs of truck tractors.

The proposed treatment would consist of two feet of red/white material secured at the top of each mud flap by plates or, optionally, affixed horizontally near the bottom of each side of the back of the tractor body, and upper corner markings of white material on the back of the cab, as shown in Figure III-1. This system provides a reflective image indicating the overall width and height of the tractor. It is the same as the image of trailers without rear underrride protection devices except for the open four feet between the mud flaps. The tail lamps and possibly the conventional reflex reflectors would be located in the open space, helping to complete the image in a way that resembles trailers with the established conspicuity system. The proposed conspicuity requirement for tractors, unlike the requirement that is now in place for large trailers, would not relieve the requirement for conventional reflex reflectors because the total rear illumination of tractors would remain less than that of trailers.

Truck tractors are subject to fewer rear lighting requirements than other large trucks over 80 inches wide because tractor rear lighting is essentially useless in the normal trailer towing operation. Unlike other trucks, tractors are not required to have rear side marker lamps, rear clearance lamps, or rear identification lamps, and their rear turn signal lamps may be deleted if double sided turn signal lamps are used on the front fenders.

FIGURE III-1



The only rear running lamps on tractors are the tail lamps, which are mounted unusually close together on tractors. Ongoing research at the University of Michigan Transportation research Institute concerning the relative placement of low beam and high beam headlamps demonstrates that the separation distance of vehicle lighting can lead to errors in judging the true distance of a closing vehicle. With a tractor, this effect may be even greater because of the particularly narrow taillight spacing which can lead to a significant overestimation of the true distance of a lead tractor.

The inexpensive and convenient use of retroreflective material can be expected to compensate for the lack of other lighting during the exposure time of tractors operating (or parked) without trailers. The familiarity of the public with the retroreflective conspicuity treatments of large trailers should improve the recognition of similarly treated bobtail tractors and may make the action more effective than it would have been in the past.

IV. BENEFITS

The benefits estimation procedures that were applied in the Final Regulatory Evaluation supporting the December 1992 Final Rule requiring conspicuity treatment on large trailers offer a basis for estimating the benefits of a similar tractor conspicuity system.[1] Estimation of the trailer conspicuity treatment's crash-prevention effectiveness was based on the results of an extensive fleet study of the accident experience of 2,000 treated vehicles as compared to that of 2,000 untreated vehicles. The agency solicited public comment on the evaluation of the study's results. As discussed in the regulatory evaluation supporting the Final Rule, the agency augmented the initial data set with additional crash data that the major carrier in the field study continued to collect. The agency concluded that the likely result of a trailer conspicuity treatment would be the prevention of 25 percent of rear collisions (and 15 percent of side collisions) and significant mitigation of the severity of many collisions that would not be prevented. Comments from fleet owners conducting private studies of the effectiveness of conspicuity retrofit programs supported the agency's benefit assessment as realistic and achievable.

The required rear treatment of trailers consists of between 12 and 17 linear feet of conspicuity material while the proposed tractor treatment would consist of only 8 feet of

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[1] "Final Regulatory Evaluation, Amendment to FMVSS No. 108 to Require Retroreflective Material on the Sides and Rears of Large Trailers," Docket No. 80-9; Notice 6; Final Rule issued December 10, 1992 (57 FR 58406).

material distributed in the most advantageous locations. However, since the base rear lighting of a tractor is much less than that of a trailer, the added degree of conspicuity of a tractor provided by the proposed treatment would at least equal the relative improvement in trailer conspicuity provided by its treatment. Therefore, it is not unreasonable to assume a similar rate of crash prevention for trailer and tractor conspicuity treatments.

The regulatory evaluation of trailer conspicuity estimated the property damage savings of preventing a crash into the rear of a trailer at $10,869 and of mitigating the remaining crashes at an average of $2,075 each, in 1992 dollars, or $11,434 and $2,183, respectively, in 1994 dollars.[2] In the absence of specific cost data on vehicle property damage sustained in crashes into the rears of tractors, the agency is applying the estimated average property damage cost of crashes into the rears of large trailers to estimate savings that would be attributable to the conspicuity material preventing and mitigating the severity of crashes into the rears of tractors. This would seem to be a reasonable approach, since vehicles striking the rears of large trailers and tractors are typically passenger vehicles and these vehicles usually sustain most of the damage.

In estimating benefits, the agency is assuming that crashes, fatalities, and injuries occur over

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[2] Crash severity mitigation pertains to the fact that many of the crashes that would still occur would be less severe because the conspicuity material would enable drivers of following vehicles to apply their brakes sooner because they would see the tractor sooner, thereby reducing impact speeds and the amount of vehicle damage. Crash severity could also be mitigated by steering maneuvers that result in less property damage.

a given tractor fleet's operating lifetime in proportion to its travel. To account for degradation in performance of the conspicuity material after years of in-use exposure, in estimating benefits, the agency is also assuming that the conspicuity material would be effective for the first 15 years of a given model year tractor fleet's life. This is in approximate agreement with the performance ascribed to conspicuity material for the trailer conspicuity rulemaking. During the development of the trailer conspicuity standard, the University of Michigan Transportation Research Institute examined retroreflective material in service on trailers for 10 years and found only moderate degradation in brightness. The brightness requirement in the trailer final rule included a margin thought to assure performance over a 14 year trailer life, and the regulatory evaluation included benefits accruing over that period. In the absence of longer term weathering information, the agency is not presuming high retroreflectivity performance of the conspicuity material beyond 15 years of truck tractor operation. Tractor (or, more generally, heavy truck) travel and survivability by vehicle age, as reported in Table V-1 in the following cost section, indicate that tractor miles of travel over the first 15 years of operation account for 95.75 percent of total lifetime travel. Restricting the estimation of benefits to the first 15 years of operation, therefore, excludes from consideration the prevention (or mitigation) of only those crashes, fatalities, and injuries occurring during the final 4.25 percent of lifetime fleet travel.

Based on the preceding information and the 1990-1993 average annual experience of crashes into the rears of bobtail tractors at night, as presented in Table III-1, above, the following

annual property damage savings or benefits would be expected from a fully equipped tractor fleet:

Crash prevention:

1,105 estimated nighttime crashes into the rears of tractors
X 25% estimated portion prevented by fully effective conspicuity treatment
276 estimated crashes prevented annually by fully effective treatment

276 X .9575 (adjustment factor to account for reduction in retroreflectivity performance after 15 years of use) = 264 crashes prevented annually

264 crashes prevented X $11,434 (property damage savings per crash prevented) = $3,019,000 in property damage savings

Crash severity mitigation:

1,105 estimated nighttime crashes into the rears of tractors
X 75% estimated portion not prevented
829 estimated crashes not prevented, but the severity of many of which would be mitigated

829 X .9575 (adjustment factor to account for reduction in retroreflectivity performance after 15 years of use) = 794 crashes that would not be prevented but which could be potentially mitigated.

794 crashes potentially mitigated X $2,183 (average mitigation per crash) = $1,733,000

Total estimated annual property damage savings:

$3,019,000	**from crash prevention**
1,733,000	**from crash severity mitigation**
$4,752,000	**total estimated annual property damage savings**

As indicated, an estimated annual property damage saving of $4.8 million would be realized.

However, the primary purpose of a tractor conspicuity rule would be to save lives and

prevent injuries. Although the agency's fleet study did not include information that would allow the direct quantification of reductions in fatalities and injuries, the agency would expect a reduction of fatal and injury-producing crashes as well as property-damage-only crashes. The comments to the trailer conspicuity docket arising from private fleet studies stressed the reduction or elimination of fatal accidents. Estimating that nighttime fatal crashes into the backs of tractors would be reduced by 15 to 25 percent[3], an annual reduction of 4 to 7 fatalities would be expected (30 nighttime fatalities [Table III-1] X 15% and 25% X .9575 (the adjustment factor to account for reduced material performance after 15 years of fleet operation). Correspondingly, the number of injuries would also be reduced by an estimated 102 to 171 injuries (713 nighttime injuries [Table III-1] X 15% and 25% X .9575).

In summary, annual benefits when the in-use tractor fleet would be fully equipped with the specified conspicuity treatment are estimated to be:

4 to 7 fatalities prevented

102 to 171 injuries prevented

$4,752,000 in property damage savings

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[3] In estimating safety benefits for the trailer conspicuity regulation, the agency conservatively estimated that 15 percent of the fatalities sustained in crashes into trailer rears would be prevented, whereas the data indicated that 25 percent of all crashes would be prevented. In estimating safety benefits of the subject tractor conspicuity proposed rulemaking, the agency will use a range of fatality and injury-prevention effectiveness of 15-25 percent to reflect the treatment's potential greater effectiveness due to the poorer rearend conspicuity of present tractors.

V. COSTS

The cost estimate is based on the material and labor costs used in the final regulatory evaluation that supported the December 1992 Final Rule that required retroreflective material to be installed on the backs of new large trailers. The reflective material cost of $0.675 per linear foot is used, although market competition apparently has served to reduce the cost of material to about $0.60 per linear foot to large trailer manufacturers. Likewise, the installation labor estimate of 10 minutes for the rear of a trailer has been retained, although less material is to be applied to a tractor, and the mud flap plates add very little effort to mud flap installation.

As noted above, manufacturers may secure the lower horizontal strips of retroreflective material to the top of mud flaps or, alternatively, affix them horizontally near the bottom of each side of the back of the tractor body. The use of mud flaps with integral conspicuity material may develop as a lower cost manufacturing solution. It should be noted that neither NHTSA nor the Federal Highway Administration requires mud flaps on any truck, tractor, or trailer. However, the agency believes that state laws requiring mud flaps cause most tractors to be equipped with them. Mud flap brackets are not included as a cost element of the conspicuity system because they are already supplied on most tractors and because manufacturers that do not use them may attach the conspicuity material to the rear of the cab as an alternative.

- 8 feet of DOT-C2 retroreflective material @ $0.675/foot
- aluminum mounting plates @ $1.11 each, as estimated by NHTSA
- Labor rate -- $22.50/hr., including fringe benefits
- Installation time -- 10 minutes

The consumer cost per tractor of the proposed conspicuity treatment incorporating the two alternative locations for the lower strips of material are estimated below.

(1) conspicuity system with strips mounted on the back of the tractor:

$0.675 X 8' [retroreflective material] + $22.50 [labor rate]/6 = $9.15 manufacturer's cost X 1.51 consumer markup factor = $13.82

(2) conspicuity system with strips mounted at the top of the mud flaps secured by plates:

$0.675 X 8' [retroreflective material] + $1.11 X 2 [mounting plates] + $22.50 [labor rate]/6 = $11.37 manufacturer's cost X 1.51 consumer markup factor = $17.17

Depending on where the lower strips were mounted, then, **the estimated consumer cost per tractor would be $13.82 or $17.17.**

Affected Truck Population:

The agency informally obtained the following data from several heavy truck manufacturers on the proportion of trucks they produce that are configured as tractors:

	Class 7		Class 8	
	Tractors	Single-units	Tractors	Single-unit
Kenworth	0%	100%	90%	10%
Peterbilt	0%	100%	85%	15%
Volvo White/GMC	9%	91%	81%	19%
Freightliner	13%	87%	98%	2%

Based on the preceding distribution, for cost estimation purposes, the agency is assuming that 10 percent of Class 7 trucks and 90 percent of Class 8 trucks are truck tractors. In 1993, approximately 80,000 Class 7 and 157,000 Class 8 trucks were produced. Therefore, the 1993 truck production included about 150,000 truck tractors. Based on 1993 production, **the estimated annual cost to consumers of the proposed truck tractor conspicuity requirement would range from $2,073,000 to $2,575,000 ($13.82 and $17.17 per tractor X 150,000 tractors)**.

To assess the cost effectiveness of the conspicuity treatment, the benefits of property damage savings, which would accrue over the operating life of the tractor fleet, must be discounted for a valid comparison to costs, which are incurred at the time of vehicle purchase. Table V-1 shows the derivation of the discount factors that are applied to estimated future benefits to calculate their present discounted values. The method applied assumes that the benefits of crash prevention and crash severity mitigation would accrue in proportion to the number of miles a given model year's tractor fleet would be driven from year to year as it aged. And, since the proposed requirement relates to truck tractors running bobtail, the analysis also

assumes that bobtails' travel will be proportionate to the truck mileage from year to year. The vehicle miles of travel by vehicle age and the survival probability schedules used are presented in the first two columns of Table V-1. Weighted VMT (col. 1 X col. 2) and the percent distribution of VMT over the fleet's 25 year life are shown in columns 3 and 4, respectively.

Table V-1 also shows the discount factors by year for the 2, 4, 7, and 10 percent discount rates. The four right-hand columns show the weighted values for these discount factors that were derived by multiplying the yearly discount factors by the share of lifetime travel that occurs in the respective years. The values in the last four columns are then summed to produce the following discount factors for the respective discount rates: 0.8988 for a 2 percent discount rate, 0.8152 (4 percent), 0.7144 (7 percent), and 0.6355 (10 percent). These would be the appropriate discount factors to apply if it were assumed that conspicuity treatment benefits would be realized over the full operating life of the tractor fleet. However, since the above estimates of benefits assume that the conspicuity material would have reduced performance beyond 15 years of fleet operation, and thus produce no benefits for those later years, the respective right hand columns in Table V-1 are added only through the fifteenth year to derive the appropriate discount factors to apply to the estimate of property damage savings. The discount factors so derived are 0.8686 for a 2 percent discount rate, 0.7933 (4 percent), 0.7009 (7 percent), and 0.6272 (10 percent). Further, before applying these discount factors, the estimated property damage savings of $4,752,000

TABLE V-1
HEAVY TRUCK DISCOUNT FACTORS

Vehicle Age (years)	VMT	Survival Prob.	Weighted VMT	Percent Total VMT	Mid-Year Discount Factors 2%	4%	7%	10%	Weighted Present Discounted Value Factors 2%	4%	7%	10%
1	90572	1.000	90572	0.1311	0.9901	0.9806	0.9667	0.9535	0.1298	0.1286	0.1267	0.1250
2	83555	0.999	83471	0.1208	0.9707	0.9429	0.9035	0.8668	0.1173	0.1139	0.1092	0.1047
3	76539	0.988	75621	0.1095	0.9517	0.9066	0.8444	0.7880	0.1042	0.0992	0.0924	0.0863
4	68540	0.966	66210	0.0958	0.9330	0.8717	0.7891	0.7164	0.0894	0.0835	0.0756	0.0687
5	63395	0.946	59972	0.0868	0.9147	0.8382	0.7375	0.6512	0.0794	0.0728	0.0640	0.0565
6	57364	0.925	53062	0.0768	0.8968	0.8060	0.6893	0.5920	0.0689	0.0619	0.0529	0.0455
7	50987	0.897	45735	0.0662	0.8792	0.7750	0.6442	0.5382	0.0582	0.0513	0.0426	0.0356
8	43496	0.862	37494	0.0543	0.8620	0.7452	0.6020	0.4893	0.0468	0.0404	0.0327	0.0266
9	40542	0.825	33447	0.0484	0.8451	0.7165	0.5626	0.4448	0.0409	0.0347	0.0272	0.0215
10	36747	0.771	28332	0.0410	0.8285	0.6889	0.5258	0.4044	0.0340	0.0283	0.0216	0.0166
11	34000	0.710	24140	0.0349	0.8123	0.6624	0.4914	0.3676	0.0284	0.0231	0.0172	0.0128
12	32000	0.645	20640	0.0299	0.7963	0.6370	0.4593	0.3342	0.0238	0.0190	0.0137	0.0100
13	30000	0.573	17190	0.0249	0.7807	0.6125	0.4292	0.3038	0.0194	0.0152	0.0107	0.0076
14	28000	0.502	14056	0.0203	0.7654	0.5889	0.4012	0.2762	0.0156	0.0120	0.0082	0.0056
15	26000	0.441	11466	0.0166	0.7504	0.5663	0.3749	0.2511	0.0125	0.0094	0.0062	0.0042
16	24000	0.380	9120	0.0132	0.7357	0.5445	0.3504	0.2283	0.0097	0.0072	0.0046	0.0030
17	22000	0.320	7040	0.0102	0.7213	0.5235	0.3275	0.2075	0.0073	0.0053	0.0033	0.0021
18	20000	0.260	5200	0.0075	0.7071	0.5034	0.3060	0.1886	0.0053	0.0038	0.0023	0.0014
19	18000	0.200	3600	0.0052	0.6933	0.4840	0.2860	0.1715	0.0036	0.0025	0.0015	0.0009
20	16000	0.140	2240	0.0032	0.6797	0.4654	0.2673	0.1559	0.0022	0.0015	0.0009	0.0005
21	14000	0.080	1120	0.0016	0.6663	0.4475	0.2498	0.1417	0.0011	0.0007	0.0004	0.0002
22	12000	0.050	600	0.0009	0.6533	0.4303	0.2335	0.1288	0.0006	0.0004	0.0002	0.0001
23	10000	0.030	300	0.0004	0.6405	0.4138	0.2182	0.1171	0.0003	0.0002	0.0001	0.0001
24	8000	0.020	160	0.0002	0.6279	0.3978	0.2039	0.1065	0.0001	0.0001	0.0000	0.0000
25	6000	0.010	60	0.0001	0.6156	0.3825	0.1906	0.0968	0.0001	0.0000	0.0000	0.0000
Total			690,848	1.0000					0.8988	0.8152	0.7144	0.6355

must be divided by the 0.9575 factor applied in deriving it (to limit the estimation of benefits to the first 15 years of fleet operation); otherwise, the 0.9575 factor would be incorporated twice in the calculations.

Following this procedure, the discounted values of the estimated $4,752,000 in property damage savings are calculated to be $4,311,000 (2 percent discount rate), $3,937,000 (4 percent), $3,479,000 (7 percent), and $3,113,000 (10 percent). The cost of the proposed requirement, $2,575,000 at most, would be more than covered by the present value of the estimated annual property damage savings. The fact that estimated property damage savings would cover the cost of the conspicuity treatment means that the estimated 4 to 7 fatalities and 102 to 171 injuries that would be prevented annually would be achieved at no net economic cost.

VI. LEADTIME

The agency is proposing a 120 day leadtime for implementing the subject requirement. Minimal changes would be needed for implementation. The conspicuity material is presently being produced in large quantities, and manufacturers should be able to increase production to meet increased demand for their products that would result under this proposal. The material could easily be installed in the specified locations on the backs of tractors.

VII. SMALL BUSINESS IMPACTS

NHTSA has considered the effects of this proposed requirement under the Regulatory Flexibility Act. This amendment to FMVSS No. 108 would not be expected to have a significant impact on a substantial number of small entities. The regulation would principally affect tractor truck manufacturers and manufacturers of conspicuity enhancing materials. Tractor truck manufacturers are not small businesses. Manufacturers of conspicuity enhancing materials are generally small businesses within the meaning of the Regulatory Flexibility Act; the proposed requirement for conspicuity material on the backs of new truck tractors would provide the potential for some increase in business.

VIII. CUMULATIVE IMPACTS OF RECENT RULEMAKINGS

Section 1(b)11 of Executive Order 12866 Regulatory Planning and Review requires the agencies to take into account to the extent practicable "the costs of cumulative regulations". To adhere to this requirement, the agency has decided to examine both the costs and benefits by vehicle type of all substantial NHTSA final rules affecting medium and heavy vehicles with a cost or benefit impact effective in MY 1990 or later. In addition, proposed rules will also be identified and preliminary cost and benefit estimates provided.

Costs include primary cost, secondary weight costs, and the lifetime discounted fuel costs for both primary and secondary weight. Costs will be presented in two ways, the cost per affected vehicle and the average cost over all vehicles. The cost per affected vehicle includes the range of costs that any vehicle might incur. For example, if two different vehicles need different countermeasures to meet the standard, a range will show the cost for both vehicles. The average cost over all vehicles takes into account voluntary compliance before the rule was promulgated or planned voluntary compliance before the rule was effective and the percent of the fleet for which the rule is applicable. Costs are provided in 1994 dollars, using the implicit GDP deflator to inflate previous estimates to 1994 dollars.

Benefits are provided on an annual basis for the fleet once all vehicles in the fleet meet the rule. Benefit estimates take into account voluntary compliance.

TABLE VIII-1
COSTS OF RECENT MEDIUM & HEAVY TRUCK RULEMAKINGS
(Includes Secondary Weight and Fuel Impacts)
(1994 Dollars)

Description	Effective Model Year	Cost Per Affected Vehicle	Cost Per Average Vehicle	Estimated Total Annual Cost
FMVSS No. 108; Large Trailer Conspicuity	Effective September 1993	$106	$106	$18.0 million
FMVSS 121 Control Line Pressure Balance	1992	-$10 to -$49	$28 savings	$4.8 million savings
FMVSS 105 & 121 Automatic Brake Adjusters	1993 - 105 1994 - 121	$0 $171-428	$0 $219	$29.9 milllion
FMVSS 105, Stopping Distance Requirements	1999	$5 1st year $2 out years	$5 1st year $2 out years	$1.0 mil. 1st year $0.33 mil. out years
FMVSS 121, Stopping Distance Requirements	Truck Tractors - 1997 Trucks and Buses - 1998	$29 - $79 1st year $10 - $60 out years	$56 1st year $37 out years	$11.7 mil. 1st yr. $7.7 mil. out years
FMVSS 105 and 121, Stability and Control While Braking Requirements	All hydraulically braked vehicles - 1999 air-braked truck tractors, trucks, and buses - 1998	Truck Tractors - $1519-$1644 Single Unit Trucks and buses - $393-$974 Towing trailers - $1100 Non-towing trailers - $349 trailer converter Dollies - $1270	Truck Tractors - $1533 Single Unit Trucks and buses - $912 Towing trailers - $1106 Non-towing trailers - $849 trailer converter Dollies - $1270	$632 mil.

TABLE VIII-2
BENEFITS OF RECENT MEDIUM & HEAVY TRUCK RULEMAKINGS
(Annual benefits when all vehicles meet the standard)

Description	Fatalities Prevented	Injuries Reduced	Damage Savings
FMVSS No. 108; Large Trailer Conspicuity	80	1,315	$43.5 million
FMVSS 121 Control Line Pressure Balance	None (cannot quantify)	None (cannot quantify)	Not Estimated
FMVSS 105 & 121 Automatic Brake Adjusters	20	310	$23.4 million
FMVSS 105, Stopping Distance Requirements	Not Estimated	Not Estimated	Not Estimated
FMVSS 121, Stopping Distance Requirements	3.2	84	$3.24 million
FMVSS 105, Stability and Control While Braking Requirements	320 - 506	15,900 - 27,413	$458 - $553 million
FMVSS 121, Stability and Control While Braking Requirements			

Table VIII-3
COSTS OF PROPOSED MEDIUM & HEAVY TRUCK RULES
(Includes Secondary Weight and Fuel Impacts)
(1994 Dollars)

Description	Effective Model Year	Cost Per Affected Vehicle	Cost Per Average Vehicle	Estimated Total Annual Cost
FMVSS 301, Crossover Fuel Lines	1 year Leadtime	$42	$42	$5.8 million
Rear Underride Protective Device (New Std)	2 year Leadtime	$130	$130	$9.8 million

Table VIII-4
BENEFITS OF PROPOSED MEDIUM & HEAVY TRUCK RULES
(Annual benefits when all vehicles meet the standard)

Description	Fatalities Prevented	Injuries Reduced	Property Damage Savings
FMVSS 301 Crossover Fuel Lines	0.6	55	$282,000 $3.5 million Environmental Damage Sav.
Rear Underride Protective Device (New Std)	8-18	141-211 AIS 1 69-103 AIS 2-5	